



Comprehensive Monitoring Program Report TAPS Maintenance Program 1999/2000 January 2001

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1.0 Introduction and Purpose

The Joint Pipeline Office (JPO) 1999/2000 Maintenance CMP program was developed to provide oversight of the Trans-Alaska Pipeline System (TAPS) focusing on the maintenance requirements and strategies necessary to ensure operational safety and reliability of TAPS systems and equipment. The requirements basis for maintenance of the TAPS is principally taken from the following four documents: (1) Public law 93-153, dated November 16, 1973, which amends section 28 of the Mineral Leasing Act of 1920; (2) The Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline, dated January 23, 1974 (hereinafter referred to as the "Grant"); (3) The Alaska State Lease of Right-of-Way, dated May 3, 1974 (hereinafter referred to as the "Lease" and (4) 49 CFR Part 195. These documents broadly define the maintenance requirements for TAPS. Public Law 95-153 further states the requirements for renewal of any Federal Grant of Right-of-Way, and includes the requirement for consideration of the "useful life" of the system prior to renewal. The Federal Agreement and Grant of Right-of-Way for TAPS expires in January 2004 unless renewed. The Alaska State Lease of Right-of-Way for TAPS expires in May 2004 unless renewed.

The JPO considers the "useful life" of TAPS to be directly related to system condition monitoring and maintenance activities. As such, the JPO 1999/2000 Maintenance CMP program has been designed to (1) comprehensively evaluate the Alyeska Pipeline Service Company (APSC) monitoring and maintenance strategies and program structure; (2) identify the maintenance requirements of critical TAPS systems necessary to maintain system safety and reliability; (3) measure the degree of compliance to the Grant/Lease and regulatory requirements for maintenance of TAPS; (4) monitor resolution of the 1997/1999 Maintenance CMP

issues; and (5) provide quantitative information regarding the state of the APSC maintenance program.

2.0 Methodology/Scope

The 1999/2000 JPO CMP programs have attempted to establish a "systems based" approach to TAPS oversight. As such, the JPO maintenance oversight efforts have been designed to address the maintenance needs of particular TAPS systems, how those systems are monitored, and how the results of monitoring are transitioned into maintenance work activities. For implementation of this systems based approach, JPO has developed a set of matrices, which identify the relationships between (1) JPO Agency Work Programs; (2) the Grant/Lease and Regulatory Requirements for TAPS; and (3) the systems that comprise TAPS. JPO work planning and documentation of work efforts are comprehensively implemented through a computer based application of this matrix model.

The 1999/2000 Maintenance CMP work is divided into three major elements: (1) TAPS Monitoring and Maintenance Program Reviews; (2) TAPS Maintenance Baseline Assessments; and (3) 1997/1999 Maintenance CMP Issues. A discussion of each of these elements follows:

2.1 TAPS MONITORING AND MAINTENANCE PROGRAM REVIEW

This element provides for (1) review of the various TAPS monitoring and surveillance program(s); (2) analysis of any emerging issues, concerns, and associated corrective actions; (3) assessment of the process by which issues, concerns and recommendations are tracked through to closure (either justification for no work required or development of a work activity such as baseline maintenance or project development); and (4) JPO field monitoring to track identified issues, concerns or corrective actions.

An explanation of the relationship between the 1999/2000 Maintenance and Construction CMP reports must be made here. Construction projects typically result from recommendations made by the APSC surveillance, monitoring, and maintenance organizations; projects being the avenue of corrective action. To avoid duplication, references to the 1999/2000 Construction CMP will be found throughout this report.

2.2 TAPS MAINTENANCE BASELINE ASSESSMENTS

This element provides an assessment of the APSC maintenance program by comparing it to industry standards for maintenance management. The maintenance management standard is comprised of programmatic elements considered by various industries to best provide for equipment safety and reliability. This assessment, termed the Asset Maintenance Management (AMM) assessment, is intended to measure the APSC maintenance program against these elements and identify any relative strengths or weaknesses. This will then provide a basis for JPO declarations regarding APSC maintenance capabilities as well as specifics for continuous improvement. This work element also includes application of Reliability Centered Maintenance (RCM) analyses of critical TAPS systems to identify specific maintenance requirements necessary to ensure operational safety and reliability. The AMM assessment and the RCM analyses are discussed further in this report under section 3.0 Background.

The JPO currently has two BLM contracts to support this work element. The first is with Aladon Ltd., a company with internationally recognized expertise in Maintenance Management and RCM analyses, to provide strategic planning support to JPO throughout this effort; the second is with Spearhead System Consultants Ltd., a full-service, strategic consulting practice which specializes in AMM methods and techniques. Spearhead is to provide expert maintenance consultants to facilitate and support the AMM assessment and the RCM analyses. JPO began implementation of this work element in November 2000.

2.3 JPO 1997/1999 MAINTENANCE CMP ISSUES

This element provides for tracking resolution of the following issues identified in the 1997/1999 Maintenance CMP review.

1. TAPS Electrical Systems
2. Preventive Maintenance
3. Slope Stability
4. Erosion Control
5. Valve Maintenance
6. Work Pad Maintenance
7. Material Sites
8. Change Management (AAI 1955)

3.0 Background

3.1 JPO POSITION ON TAPS MAINTENANCE AND USEFUL LIFE

To evaluate the TAPS maintenance, system integrity, and useful life requirements in a comprehensive manner, the JPO is in the process of conducting: (1) an Asset Maintenance Management (AMM) Assessment; and (2) Reliability Centered Maintenance analyses of critical TAPS systems. The AMM assessment is to provide a relative measure of the current APSC approach to TAPS maintenance. The RCM analyses are to facilitate identification of the critical system(s) current functional state and the maintenance requirements necessary to ensure long term (30 year) operational safety and reliability.

The combined objective of the TAPS AMM Assessment and RCM analyses is to provide a structured, maintenance-based methodology, to evaluate the maintenance strategies and resulting useful life capacity of the TAPS. This is of particular importance today as TAPS is a declining asset and the APSC expert workforce is aging. This objective is in alignment with the requirements listed in section 4.0 Requirements, below.

The following sections provide a discussion of the AMM assessment and the RCM analyses.

3.1.1 Asset Maintenance Management (AMM) Assessment

Over the time period of this CMP effort, APSC managed the TAPS according to an asset management model. The TAPS consists of several assets, each managed separately, but under two business units, (1) Pipeline Business Unit (PBU) and (2) Valdez Business Unit (VBU). This management structure makes the overall TAPS maintenance management strategy unclear.

Principle 3 of the Agreement and Grant of Right-of-Way, requires APSC to manage and maintain the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology.

In order to provide a "state of the art" maintenance management baseline from which to evaluate APSC maintenance management practices, the AMM assessment shall measure against a de-facto standard termed "World Class." There are variations on the definition of "World Class" maintenance management, depending upon the industry considered, however, there are relatively consistent programmatic elements and associated measurement criteria. For the purposes of this assessment, JPO considers the following programmatic elements to be necessary to the "state of the art" maintenance management of TAPS:

- * Management Leadership
- * Maintenance, Engineering & Operations Organizational Structures
- * Roles and Responsibilities
- * Documentation Management
- * Maintenance Planning
- * Logistical Support
- * Resource Management
- * Computerized Maintenance Management System
- * Maintenance Management Metrics
- * Materials Management Metrics
- * Root Cause Failure Analysis Process
- * Maintenance Budgets

3.1.2 Reliability Centered Maintenance (RCM) Analyses

Reliability centered maintenance is a highly prescriptive process used to identify the maintenance needs of a physical asset to ensure operational safety and functional reliability. The RCM analysis involves the asset operators, maintainers, and responsible engineering resources in a comprehensive and interactive manner. The RCM methodology JPO advocates complies with the only existing internationally recognized RCM standard, and is designed to quantifiably answer the following seven questions relevant to an operating asset:

1. What are the functions and associated desired standards of performance of the asset in its present operating context (functions)?
2. In what ways can it fail to fulfill its functions (functional failures)?
3. What causes each functional failure (failure modes)?
4. What happens when each failure occurs (failure effects)?
5. In what way does each failure matter (failure consequences)?
6. What should be done to predict or prevent each failure (proactive tasks and task intervals)?
7. What should be done if a suitable proactive task cannot be found (default actions)?

The application of this RCM methodology on critical TAPS systems will provide the following information:

- * The current functional state of the system.
- * Adequacy of the current system monitoring methods to assure identification of potential functional failures (inclusive of hidden failure modes).
- * The effectiveness of current maintenance activities to ensure functional reliability of the system (i.e. corrective actions taken to address functional failure potentials).

* Suitability of the systems current operating context to that of the original design/design basis.

3.2 APSC COMMITMENTS

In January of 1999, JPO began discussions with APSC regarding the AMM assessment and RCM analyses discussed above; APSC verbally emphasized their concurrence to the benefits of these evaluations and agreed to cooperate and assist where possible. In January of 2001, APSC formally agreed in a written Memorandum of Agreement (MOA), signed January 9, 2001, to support the implementation of the AMM and RCM analyses. Attachment (1) provides a copy of this MOA.

To date, APSC has conducted their own AMM assessments, one for the Pipeline Business Unit (PBU) and one for the Valdez Business Unit (VBU). APSC procured a team of maintenance management consultants, headed by BP Amoco, to conduct these assessments, and has shared the associated philosophy, methodology, scope, and results with the JPO. APSC has begun implementation of the results of these assessments and has maintained an open relationship with JPO throughout these efforts.

3.3 JPO 1997/1999 MAINTENANCE CMP

The JPO Comprehensive Monitoring Program has been consolidated from 12 oversight categories to four oversight programs: Construction/Termination, Operations, Maintenance, and Culture. The previous JPO Maintenance CMP report published in April 1999, titled An Evaluation of Selected Portions of the TAPS Maintenance Program January 1997-April 1999, concluded the following:

* Five of the stipulations evaluated contained some aspects of noncompliance. The areas of noncompliance included slope stability, failure to update records for system changes and civil maintenance, inconsistency between existing conditions and design requirements, and vegetation damage at material sites. APSC committed to address each issue.

* Two slopes at Squirrel Creek were not in compliance with design basis requirements and Stipulation 3.5 Slope Stability of the Grant and Lease. Instrumentation data showed the Squirrel Creek slopes were thawed, resulting in a degradation of permafrost and a finding of noncompliance with Stipulation 3.9 Construction and Operation. The degree of integrity of the Squirrel Creek slopes under design contingency earthquake conditions was in question and being reviewed by JPO and APSC. If it could not be demonstrated that these slopes were safe, civil improvements must be completed. APSC scheduled a risk assessment for 1999 to evaluate the Squirrel Creek slopes. APSC completed the Pump Station 11 slope risk assessment on December 4, 1999, which JPO reviewed. APSC concluded in their Pump Station 11 risk assessment that the probability of a crude oil leak or spill was very remote. Appropriate mitigation actions will follow the review of the risk assessments.

* The Alaska Department of Labor electrical inspector found six National Electrical Code (NEC) violations on TAPS that were within the scope of the CMP. APSC corrected the violations and JPO verified the corrections. APSC now requires third party inspection of electrical installations and modifications. If consistently followed, this requirement should prevent future noncompliance with the National Electrical Code.

* APSC was meeting their commitments for the mainline valve testing and repair program. Planning, preparation, and execution of mainline valve repair projects achieved a high standard of performance. Maintenance goals included 1) testing of 44 mainline valves for internal leak-through in 1998, and testing of the remaining mainline valves by the year 2000, 2) repairing Check Valve 122, and 3) replacing Remote Gate Valve 80. The last two items were completed in 1998. JPO will follow all Valve Program commitments through to completion.

* APSC did not coordinate well with JPO regulatory agencies during the planning, scheduling, and design of a number of maintenance projects along the TAPS right-of-way. This, coupled with APSC's lack of internal coordination, resulted in delays in the permitting and execution of some projects. To correct this problem, APSC is clarifying roles and responsibilities and providing additional training to their asset managers.

* APSC maintenance records only partially documented some workpad and above ground maintenance repairs. This hindered the trending of damage caused by flood, erosion and thawing. JPO considered this to be an instance of noncompliance with Grant and Lease Stipulation 1.18 Surveillance and Maintenance. Although APSC disagreed with this noncompliance determination, they are working to improve tracking of civil maintenance repairs.

* New projects were commissioned and turned over to pipeline operators without the necessary preventive maintenance procedures being established. Other electrical system modifications lacked updated drawings. APSC changed procedures to ensure timely completion of preventive maintenance procedures and project records.

These 1997/1999 Maintenance CMP issues have been integrated into the JPO 1999/2000 oversight efforts; the results of which are presented in section 5.0 Results, below.

4.0 Requirements

The following provides a summary of the requirements to which JPO has operated with regard to the maintenance and useful life of TAPS:

4.1 PUBLIC LAW

Public Law 93-153, dated November 16, 1973, was an act to amend section 28 of the Mineral Leasing Act of 1920, and to authorize the trans-Alaska oil pipeline and provide other Federal rights-of-way requirements. Title I of this act includes amendments to Section 28 of the Mineral Leasing Act of 1920. Title I requires the following regarding right-of-ways through any Federal lands:

Regulatory Authority

(f) Rights-of-way or permits granted or renewed pursuant to this section shall be subject to regulations promulgated in accord with these provisions of this section and shall be subject to such terms and conditions as the Secretary or agency head may prescribe regarding extent, duration, survey, location, construction, operation, maintenance, use, and termination.

Technical and Financial Capability

(j) The Secretary or agency head shall grant or renew a right-of-way or permit under this section only when he is satisfied that the application has the technical and financial capability to construct, operate, maintain, and terminate the project for which the right-of-way or permit is requested in accordance with the requirements of this section.

Duration of Grant

(n) Each right-of-way or permit granted or renewed pursuant to this section shall be limited to a reasonable term in light of all circumstances concerning the project, but in no event more than thirty years. In determining the duration of a right-of-way the Secretary or agency head shall, among other things, take into consideration the cost of the facility, its useful life, and any public purpose it serves. The secretary or agency head shall renew any right-of-way, in accordance with the provisions of this section, so long as the project is in commercial operation and is operated and maintained in accordance with all of the provisions of this section.

Title II of this amendment is the "Trans-Alaska Pipeline Authorization Act." Title II, in part, requires the following:

Sec. 203. (b) The Congress hereby authorizes and directs the Secretary of the Interior and other appropriate Federal officers and agencies to issue and take all necessary action to administer and enforce rights-of-way, permits, leases, and other authorizations that are necessary for or related to the construction, operation, and maintenance of the trans-Alaska oil pipeline system, including roads and airstrips, as that system is generally described in the Final Environmental Impact Statement issued by the Department of the Interior on March 20, 1972.

4.2 AGREEMENT AND GRANT OF RIGHT-OF-WAY FOR TRANS-ALASKA PIPELINE

The following requirements of the Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline are the primary maintenance requirements under review:

Principle 3: Permittees shall manage, supervise and implement the construction, operation, maintenance and termination of the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology. In the exercise of these functions, Permittees consent and shall submit to such review, inspection and compliance procedures relating to construction, operation, maintenance and termination of the Pipeline System as are provided for in this Agreement and other applicable authorizations. The parties intend that this Agreement shall not in any way derogate from, or be construed as being inconsistent with, the provisions of Section 203 (d) of the Trans-Alaska Pipeline Authorization Act, 87 Stat. 585 (1973), relating the National Environmental Policy Act, 83 Stat. 852, 42 U.S.C. 4321 et seq.

Stipulation 1.18 Surveillance and Maintenance: During the construction, operation, maintenance and termination of the Pipeline System, Permittees shall conduct a surveillance and maintenance program applicable to the subarctic and arctic environment. This program shall be designed to: (1) provide for public health and safety; (2) prevent damage to natural resources; (3) prevent erosion; and (4) maintain Pipeline System integrity.

Stipulation 1.18.3: Permittees shall maintain complete and up-to-date records on construction, operation, maintenance and termination activities performed in connection with the Pipeline System. Such records shall include surveillance data, leak and break records, necessary operational data, modification records and such other data as the Authorized Officer may require.

Additionally, this report is a summarization of several reports produced throughout years 1999 and 2000. Each report provides the applicable Grant/Lease principles, sections, or stipulation reviewed for compliance. The following provides a list of those Grant/Lease requirements for which maintenance surveillances were conducted in 1999 and 2000:

1. Principle (3)
2. Section 9 Construction Plans and Quality Assurance Program
3. Section 10 Compliance With Notices To Proceed
4. General Stipulation 1.7 Notice to Proceed
5. General Stipulation 1.8 Changes in Conditions
6. General Stipulation 1.12 Regulation of Public Access
7. General Stipulation 1.17 Fire Prevention and Suppression
8. General Stipulation 1.18 Surveillance and Maintenance
9. General Stipulation 1.20 Health and Safety
10. General Stipulation 1.21 Conduct of Operations
11. Environmental Stipulation 2.1 Environmental Briefing
12. Environmental Stipulation 2.2 Pollution Control
13. Environmental Stipulation 2.3 Buffer Strips
14. Environmental Stipulation 2.4 Erosion Control
15. Environmental Stipulation 2.5 Fish and Wildlife Protection
16. Environmental Stipulation 2.6 Materials Sites
17. Environmental Stipulation 2.7 Clearing
18. Environmental Stipulation 2.8 Disturbance of Natural Water
19. Environmental Stipulation 2.9 Off Right of Way Traffic
20. Environmental Stipulation 2.11 Use of Explosives
21. Environmental Stipulation 2.12 Restoration
22. Environmental Stipulation 2.13 Reporting of Oil Discharges
23. Environmental Stipulation 2.14 Contingency Plans
24. Technical Stipulation 3.2 Pipeline System Standards
25. Technical Stipulation 3.3 Construction Mode Requirements
26. Technical Stipulation 3.5 Slope Stability
27. Technical Stipulation 3.6 Stream and Flood Plain Crossings and Erosion
28. Technical Stipulation 3.9 Construction and Operation
29. Technical Stipulation 3.10 Pipeline Corrosion

4.3 USDOT/OPS REGULATORY REQUIREMENT

Currently, the primary regulatory basis for achieving safety goals in the pipeline industry is the set of regulations embodied in Title 49 of the Code of Federal Regulations Parts 190-199. The federal pipeline safety regulations assure safety in design, construction, inspection, testing, operation, and maintenance of natural gas and hazardous liquid pipeline facilities

5.0 Results

The following sections summarize the results of the JPO 1999/2000 Maintenance CMP efforts. These results represent a consolidation of JPO assessment reports

and engineering reports. Much of the field work associated with these reports is documented in JPO surveillance reports.

5.1 TAPS MONITORING AND MAINTENANCE PROGRAM REVIEWS

5.1.1 TAPS Monitoring and Corrective Action Process

Purpose and Scope:

The Joint Pipeline Office expressed concern about APSC's apparent inability to achieve compliance with the Grant and Lease requirements for timely and effective corrective action. APSC responded to this concern by initiating the Special Review of the Corrective Action Process, SR#00-03.

The scope of the Special Review conducted by APSC included the identification and evaluation of sixty corrective action sources and processes currently utilized inclusive of:

1. Identification of the corrective action processes utilized within TAPS;
2. Identification of any corrective action sources not covered by existing processes;
3. Evaluation of methods to identify and implement initial fixes;
4. Evaluation of methods to ensure prevention of recurrence;
5. Evaluation of management oversight and intervention methods; and
6. Root Cause Analysis and Recommended Actions to dramatically improve the corrective action processes.

APSC Findings:

Finding No. 1: A formal company-wide Corrective Action Program has not been adequately defined, developed or implemented to include the various sources of issues and potential corrective actions (High Risk). Specifically, two major grant and lease compliance programs lack an adequate corrective action process to assure that known deficiencies are captured and resolved in a timely and effective manner. These specific programs, listed below, need immediate management intervention to provide on-going assurance that compliance requirements are being maintained:

* Systems Integrity Annual Monitoring Program Reports (MP-166). Although annual reports are generated, there is no assurance that engineering recommendations are funded or acted upon by Individual Assets; and

* Civil Surveillance Program Notable Conditions (MS-31). The methods utilized to identify, prioritize and resolve identified conditions vary by Asset, with no assurance that notable conditions are consistently tracked, funded or acted upon in a timely manner by Individual Assets.

Finding No. 2: No formal strategy and long range plan has been developed to support implementation of Corrective Action IT Tools. This has resulted in ineffective and inefficient methods of corrective action assignment, workload management, status reporting, trending & analysis, lessons learned, and overall "Change Management" (High Risk).

Finding No. 3: Ayeska management has not immediately implemented methods that support an action based culture (Medium Risk).

Grant/Lease Compliance:

JPO interprets the findings presented above to be inconsistent with the intent of Principle 3 'Permittees Management of Pipeline System Maintenance'; and a non-compliance to Stipulation 1.18 Surveillance and Maintenance.

There are a number of Grant/Lease stipulations relating to systems monitored by the APSC Systems Integrity Monitoring Program Procedures (MP-166) and Surveillance Monitoring (MS-31) programs. These include: Stipulation 3.4 Earthquake and Fault Displacements; Stipulation 3.5 Slope Stability; Stipulation 3.6 Stream and Flood Plain Crossings and Erosion; Stipulation 3.7 Sea Waves; and Stipulation 3.8 Glacier Surges. The findings issued as a result of this special review indicate the potential for non-compliances to these stipulations as well.

Conclusions:

APSC's Special Review concludes that although most of the systems of the TAPS are monitored, the data accumulated as a result of those efforts is not managed effectively. This is a significant deficiency. The state and federal agencies responsible for oversight of the pipeline require assurance that the TAPS has been, and will continue to be, adequately maintained.

APSC is to be commended for the performance of the special review and the honest self-assessments issued as a result. The deficiencies identified in the corrective action process, however, must be resolved before APSC's surveillance and maintenance program can meet the compliance standard.

5.1.2 River and Flood Plains Monitoring and Maintenance

JPO 1999/2000 oversight of the River and Flood Plains Monitoring and Maintenance consisted of the following three efforts: (1) a construction project which performed repairs on the flood damaged Dietrich, Koyukuk, and Sagavanirktok rivers; (2) a construction project which conducted repairs on the Tazlina River pipeline crossing; and (3) evaluation of compliance with fish passage requirements for culverts and low water crossings. The following provides a summary of these efforts:

5.1.2.1 Assessment Report JPO-00-A-004, 1999 Flood Damage Repair Project (F075)

JPO involvement in this project was a multi-agency effort which included: (1) review of the design set forth in the Notice to Proceed (NTP) construction packages; (2) surveillance monitoring of the project implementation; and (3) review of closeout and re-vegetation issues. Findings issued as a result of JPO oversight on this project can be found in the 1999/2000 Construction CMP report.

River and Flood Plain monitoring is part of the APSC Systems Integrity Monitoring Program (MP-166) and has been a significant element of JPO oversight for years. JPO reviews the annual MP-166 reports and tracks resolution of the recommendations. Through this oversight effort, JPO has identified a disconnect between the Systems Integrity recommendations for maintenance repairs and corrective action resolution (funded construction projects). This observation is one of many that led to the request for an APSC corrective action audit (see section 5.1.1 TAPS Monitoring and Corrective Action Process).

5.1.2.2 Engineering Report JPO-00-E-009, Tazlina River Crossing Erosion Repairs (Z065)

Oversight of this project was also a multi-agency effort including: (1) review of the design set forth in the Notice to Proceed (NTP) construction packages; (2) surveillance monitoring of the project implementation; and 3) review of closeout. This project was selected for inclusion in the 1999/2000 Construction CMP and greater detail can be found there.

5.1.2.3 Assessment Report JPO-00-A-001, Alyeska Pipeline Service Company Compliance With Fish Passage and Related Environmental, Surveillance, Maintenance and Quality Program Requirements

Purpose and Scope:

In 1999, the Alaska Department of Fish and Game (ADF&G) conducted surveillances at various locations along TAPS. The purpose of these surveillances was to evaluate APSC compliance with fish passage requirements for culverts and low water crossings. Due to unsatisfactory conditions documented during the surveillances, JPO/ADF&G expanded the scope of its oversight to assess compliance with Grant/Lease stipulation 1.18 Surveillance and Maintenance and Grant/Lease sections 9B/16B Construction Plans and Quality Assurance Program. The intent of the expanded oversight was to: (1) determine the root cause of unsatisfactory compliance with fish passage requirements documented by JPO/ADF&G at low water crossings and culverts; and (2) evaluate the effectiveness of the APSC environmental, surveillance, maintenance, and quality programs in detecting, correcting and preventing fish passage concerns.

Grant/Lease Compliance:

Finding 1. APSC was not in compliance with ADF&G and Grant/Lease requirements regarding fish passage as specified in Alaska Statute (AS) 16 and stipulation 2.5.1.1 during JPO surveillances in 1999. With one exception at Grey Stream, APSC has corrected all instances of noncompliance identified by JPO surveillances in 1999. Grey Stream is scheduled for remedial action between May 15 and July 15, 2000 in response to a JPO Order. See Section 5.4 for current status of JPO Orders.

Current Status: Finding 1. On July 26, 2000 JPO and ADF&G approved and accepted the remedial actions taken by APSC at Grey Stream.

Finding 2. APSC is not in compliance with sections 9B/16B of the Grant/Lease and stipulations 1.18.1 and 1.18.3. The APSC Quality Assurance Program required by the Grant/Lease was not adequately implemented so that full compliance with Grant/Lease environmental stipulation 2.5.1.1 was assured. The APSC surveillance and maintenance program required by stipulation 1.18.1 of the Grant/Lease did not identify or prevent damage to natural resources. APSC did not maintain complete and up-to-date records on operations and maintenance activities, including surveillance and maintenance data on TAPS drainage structures, as required by stipulation 1.18.3.

Current Status: Finding 2. On March 27, 2000, APSC issued a Corrective Action Request (CAR) to address the lack of processes and documentation to demonstrate compliance with the Grant/Lease. The CAR specifies the following actions: (1) clarify criteria for surveillance maintenance, and repair of drainage structures by reviewing and revising the Surveillance Manual (MS-31) and the Maintenance and Repair Manual (MR-48); (2) initiate an annual preventive maintenance (PM) schedule for drainage structures in each Asset area; (3) Field Environmental Generalists (FEG) initiate a training program for Maintenance Coordinators (MC)

and key baseline personnel on drainage structure surveillance, maintenance, and repair from a fish passage perspective; and (4) the Environmental Protection Manual (EN-43) be revised to improve the Environmental Surveillance program and to be consistent with the methodology used in the Quality Program Manual (QA-36).

Conclusions:

Twenty percent of the culverts (two) and sixty five percent of the low water crossings (seventeen) sampled by ADF&G in 1999 were not in compliance with fish passage requirements contained in Fish Habitat Permits and Grant/Lease stipulation 2.5.1.1. Noncompliance with fish passage requirements and lack of implementation of internal Alyeska requirements results in noncompliance with Grant/Lease sections 9B/16B and stipulations 1.18.1 and 1.18.3 for these TAPS systems (low water crossings and culverts). These sections and stipulations require quality assurance, surveillance and maintenance programs designed to assure compliance with environmental stipulations and to prevent damage to natural resources. Complete and up-to-date surveillance and maintenance records are also required, and were found to be absent. Noncompliance with fish passage requirements results from the lack of effective implementation of APSC internal requirements contained in the Environmental, Surveillance, and Maintenance programs.

The findings of the assessment will not be fully closed until the JPO completes a full review of the program changes made by APSC. This review is currently under-way.

5.1.3 Fuel Gas Line (FGL) Stability Monitoring and Maintenance

The issuance of 1998 JPO findings and a DOT/OPS Notice of Probable Violation (NOPV) on the FGL led APSC to develop a five year corrective action plan for depth of ground cover over pipe, exposed pipe, and other compliance issues. JPO oversight of these issues consists of tracking the progress of the corrective action plan through monitoring of the associated yearly projects. The first phase of the plan was concluded with Project No. F068 - Fuel Gas Line Remediation Project; this project was selected for inclusion in the 1999/2000 Construction CMP and additional information can be found there.

The next phase of the Fuel Gas Line Remediation effort is currently being conducted as Project No. F960, which is being monitored as a part of JPO's continuing oversight plan.

The USDOT/OPS has issued a Notice of Probable Violation, Proposed Civil Penalty and Compliance Order, CPF No. 59502, since the fuel gas line became exposed at MP 13.02 and 16.57 and was washed out and lying in water at MP 78.6, 86, 84 Mile hill, and 120 APS. The Compliance Order requires APSC to take all practicable steps to protect their fuel gas line and associated appurtenances in those areas from future detrimental movement and external forces.

USDOT/OPS is also taking enforcement action relating to lateral vaults on the FGL at MP 18, 47 and 70 that are filled with frozen water. The vaults must be designed to minimize the entrance of water and the valve must be readily accessible during an emergency.

5.1.4 Mainline Above Ground Monitoring and Maintenance

JPO efforts on Mainline Above Ground Monitoring and Maintenance are documented in JPO Engineering Report No. 00-E-022, titled Evaluation of 1998 and 1999 MP-166 Above Ground Monitoring Reports and Status of Compliance with Stipulation 3.5, Slope Stability, dated June 30, 2000. A summary of these efforts is provided below:

Purpose and Scope:

The purpose of this review is to evaluate the TAPS Aboveground System for Compliance with Grant and Lease Stipulations 1.18 Surveillance and Maintenance, 3.5 Slope Stability, and 3.9 Construction and Operation. The scope is to evaluate APSC's 1998 and 1999 MP-166 Reports on Aboveground Monitoring, including a review of the status of slope stability.

Grant/Lease Compliance:

Stipulation 3.5 Slope Stability; and Stipulation 3.9 Construction and Operations:

JPO reviews have identified slopes along the TAPS Right-of-Way which are not in compliance with the referenced stipulations. The slopes, as well as the Vertical Support Members (VSMs), at Squirrel Creek, MP 717, are not in compliance with the TAPS design basis. The Lost Creek slope, MP 392, has significant geotechnical concerns and movement of the VSMs.

Principle (3) 'Permittees Management of Pipeline System Maintenance'; and Stipulation 1.18 Surveillance and Maintenance:

JPO review of APSC's above ground monitoring program identified the following deficiencies: (1) there is no programmatic method which provides for documented resolution of recommendations made by the APSC Systems Integrity group and (2) there is no programmatic method which provides for documented resolution of recommendations made by expert consultants. JPO interprets this as a failure of the APSC corrective action process (see section 5.1.1) and a non-compliance to the referenced stipulations.

In addition to the JPO Engineering Report 00-E-002, USDOT/OPS conducted safety inspections to determine if geotechnical features pose a threat to safety. Safety issues identified include: (1) MP 170, South Chandalar Hill monitoring rods are not being monitored; (2) MP 392.5, south side of Lost Creek slope appears to be moving and possibly impacting VSM's; (3) MLR-2 segment has moved upward a maximum of 6" in the last year; (4) VSM's at MP 608 are experiencing lateral pushing from frost heaving; and (5) the anchor at Klutina Hill is tilting.

49 CFR, Part 195. 254, 422 and 424, Design and Maintenance:

USDOT regulations require the pipeline operating pressure to be reduced by 50% of MOP, whenever the pipe is moved. USDOT/OPS has issued a NOPV in the past (CPF 53507-W, 195.424) relating to pipe line movement. At Squirrel Creek, APSC has moved its above ground piping without reducing the operating pressure. APSC is presently seeking a waiver from the DOT regulation.

Conclusions:

Published scientific evidence¹ is available to suggest that warming climatic trends are likely to expand the active zone throughout regions of Alaska's permafrost; this could affect pipeline foundations and more than 25,000 VSMs currently subject to movement². Further, 84% of all heat pipes along TAPS have some degree of blockage, potentially causing diminished heat transfer performance. The combination of warming permafrost and reduced heat pipe performance can result in frost heaving. Frost heaving presents a potential threat to VSM supports as it can cause "jacking" of the member up and out of the ground, thereby reducing VSM embedment, resulting in further jacking and reduced load bearing potential. This is a complex subject, with both natural and man made factors (heat pipe effectiveness) playing a role in changing permafrost conditions along sections of the above ground pipe. Continued ground thawing will only exacerbate the problem. A comprehensive long-term corrective action plan is necessary.

APSC has responded to these issues with (1) a request for a design basis waiver for the slopes at Squirrel Creek (currently under review by JPO); and (2) several integrated projects designed to determine the performance characteristics of heat pipes (Project F170), make aboveground pipe repairs at Squirrel Creek (Project F171), and revise the aboveground surveillance, monitoring and maintenance program linewise (Project F172). Implementation of improvements to the surveillance, monitoring, and maintenance of the aboveground system is expected as a result of these project efforts

5.1.5 Mainline Below Ground Monitoring and Maintenance

The JPO 1999/2000 efforts on mainline below ground monitoring and maintenance involve depth of cover requirements at various below ground pipe locations. These efforts are documented in (1) JPO Engineering Report No. JPO-99-E-026, titled Buried Pipeline Bend Design and Use of Overfills at Horizontal Bends and Overbends in Lieu of Deep Burial, dated October 7, 1999; (2) JPO Letter No. 99-095-JH, dated December 17, 1999; (3) APSC Letter No. 00-15426, dated February 11, 2000; and (4) APSC Letter No. 00-16072, dated August 1, 2000. The following provides a summary status of this oversight effort:

Background:

Grant/Lease Stipulations 3.2 Pipeline System Standards and 3.3 Construction Mode Requirements address the requirements for depth of cover over the buried mainline pipe. During a JPO engineering review of the original design basis depth of cover requirements, compliance concerns were identified for the following pipe configurations: (1) horizontal bends; (2) overbends; and (3) sidebends. The concerns were: (1) can APSC evidence knowledge of the location of these critical below ground pipe configurations; and (2) can APSC evidence knowledge that the depth of cover at these locations meets the minimum requirements. These concerns were transmitted to APSC via the above listed correspondence and the APSC response acknowledged gaps in their monitoring of these sites.

Grant/Lease Compliance:

If follow-up surveys determine that the depth of cover requirements at any of these locations are not being met, there will be determinations of non-compliance with Stipulations 3.2 Pipeline System Standards, 3.3 Construction Mode Requirements, 1.18 Surveillance and Maintenance, as well as Principle (3) 'Permittees Management of Pipeline System Maintenance'.

USDOT/OPS Regulatory Compliance:

DOT has issued a NOPV under 49 CFR §195.401 to APSC relating to operating their pipeline at MP 652 at a level that could adversely affect the safe operation of its pipeline system and not correcting it within a reasonable time. APSC is contesting this violation and a court hearing has been set for January 9, 2001.

Conclusions:

APSC has committed to the following actions in order to resolve JPO's concerns:

Revise System Integrity Monitoring Program Procedures Manual, MP-166, to ensure review of these bend sites after curvature pig runs.

Revise Monitoring and Surveillance Manual, MS-31, to include a list of critical overfills and sidefills to be monitored (note: the 1985 listing of these sites was originally in MS-31 as Appendix D, but was dropped during later manual revisions).

Install signs to protect critical fill areas.

Conduct surveys of the bend locations to determine actual fill thickness. Sites with insufficient fill will be forwarded to APSC Operations for repair.

This issue provides evidence of gaps in the APSC monitoring program, which is a significant element of an effective corrective action process (see section 5.1.1 TAPS Monitoring and Corrective Action Process for discussion of deficiencies in APSC's corrective action processes). JPO will continue its oversight of this issue through to resolution.

5.1.6 TAPS Corrosion Monitoring and Control History

JPO Engineering Report No. 00-E-021, titled TAPS Corrosion History, dated June 22, 2000, provides a complete history of TAPS corrosion and corrosion monitoring efforts. The following provides a summary of the more significant historical events:

- * 1969 - TAPS owners establish a Corrosion Advisory Committee, which recommends that thin film epoxy coatings be utilized, supplemented by a cathodic protection (CP) system.
- * 1972 - The epoxy coating, Scotchkote 202, is found to crack when bent under cold conditions.
- * 1974 - The Scotchkote 202 coating is discovered to experience disbondment problems
- * 1975 - APSC submits the TAPS Corrosion Control Plan to the government for approval and the DOT and DOI respond with the following concerns:
 - * Problems with Scotchkote 202 coating cracking and to what extent the belowground pipe would be tape wrapped.
 - * Method for locating disbonded coating.
 - * Long term performance of thermally insulated pipe.
 - * Stress corrosion and hydrogen cracking.
 - * Frequency of pig runs.
 - * Effects of telluric currents.
 - * Methods for pipe to soil monitoring.

The government insists that APSC tape wrap the entire belowground pipe and develop a basis for corrosion pig run frequency.

- * 1977 - TAPS becomes operational.
- * 1979 - TAPS Super Pig becomes lodged in the pipeline at Check Valve 29.
- * 1984 - DOT warns APSC that insufficient action regarding low CP readings is being taken and APSC contracts with Pipetronix to develop an enhanced magnetic flux pig.
- * 1987 - the first run of the Pipetronix pig takes place.
- * 1989 - APSC identifies over 1000 anomaly locations.
- * 1991 - APSC replaces 8.5 miles of corroded pipe in the Atigun River floodplain and installs approximately 70 full encirclement repair sleeves.
- * 1992 - State of Alaska signs an Alternative Dispute Resolution Agreement (Cooperative Agreement) with APSC intended to develop programs for enhanced detection, mitigation, repair, and prevention of corrosion.
- * 1994 - APSC introduces the CP Coupon and proposes the use of this technology as a stand-alone CP Monitoring Method.
- * 1998 - JPO approves the use of the CP Coupon as the "best available" technology and APSC provides a schedule for the development of a Corrosion Control Management Plan and Continued Development Plan.
- * 1999 - APSC submits the Corrosion Control Management Plan consisting of:
 - * Data Management Component
 - * CP Component
 - * CP Monitoring component (Includes Coupons, Close Interval Survey, and Conventional Test Stations)
 - * Pipeline Integrity Component (Uses pig data to find and repair corrosion defects)
 - * Enhance Integrated Monitoring Component: Used to make decisions regarding the need for enhancements to the CP system and pipe refurbishment (Combines Corrosion Pigs, CP Data, Mitigation History, Corrosion Activity Model into a Decision Tree).
- * 2000 - APSC submits finalized Corrosion Control Management Plan procedures with a Transition Plan for the remaining Cooperative Program CP projects. JPO decides to use this plan as the basis of compliance with 49 CFR Part 195 and Stipulation 3.10 Pipeline Corrosion.

5.1.7 TAPS Corrosion Monitoring and Maintenance

JPO efforts with regard to TAPS Corrosion Monitoring and Maintenance are documented in Engineering Report JPO-00-E-028, titled TAPS Corrosion Monitoring and Control. The following provides a summary of these efforts:

Purpose and Scope:

This effort reviewed APSC surveillance and maintenance programs as they relate to the following Grant/Lease Stipulations:

- * 3.10 Pipeline Corrosion
- * 3.2 Pipeline System Standards
- * 1.21 Conduct of Operations
- * 1.18 Surveillance and Maintenance

Through this effort, JPO assessed the adequacy of TAPS corrosion monitoring and control programs as outlined in APSC Manual MP 166 System Integrity Monitoring Program Procedures, Section 3 Corrosion Monitoring. Selected surveillance, monitoring and inspection data were collected and reviewed for program compliance, deficiency identification, and corrective action implementation. These program results were then assessed for compliance to the requirements of the above listed stipulations.

The TAPS systems reviewed were: (1) TAPS mainline Pipe, (2) major crude oil tanks; and (3) related facility crude oil piping.

Conclusions:

Review of TAPS corrosion control and monitoring programs for TAPS crude oil piping revealed that corrosion to the mainline and related facilities is of significant concern to the long-term viability of TAPS operations. In response to this concern, APSC has instituted rigorous corrosion control and monitoring programs which have been effective in identifying where corrosion threatens the integrity of the TAPS mainline pipe and related facilities, and has implemented timely corrective action. Consequently, JPO/USDOT/OPS has concluded that at this time, APSC is in compliance with the above listed stipulations and regulatory requirements.

However, corrosion continues to present a significant maintenance challenge for APSC, and this review identified some specific concerns which JPO will continue to monitor; these are as follows:

Mainline Pipe:

- * Ability to monitor mainline girth welds and mechanical damage defects.
- * Corrosion of mainline pipe. Pipeline derates have averaged 1.75 per year and the installation of repair sleeves have averaged 1.75 per year since 1996.
- * Corrosion of 6-inch by-pass piping on mainline valves. At least four bypass lines have been replaced since 1996, due to corrosion.

Pump Stations and Related Facilities:

- * Internal corrosion of TAPS facilities crude oil piping. Corrosion to piping systems continues to progress with corrosion rates dependant on crude oil flow and corrosion inhibitor effectiveness.

APSC has acknowledged the need for improvement, and has taken the following actions:

- * Girth Weld Inspections: APSC has developed new criteria for the inspection of mainline welds, which focus on deep corrosion adjacent to the girth welds. The new criteria identified nine new locations which are being investigated in 2000 under APSC project F900.
- * Mechanical Damage: APSC is in the process of performing a causal factor analysis to determine why the corrosion pig did not accurately characterize recently discovered mechanical damage at MP 710.76.
- * Mainline Pipe Corrosion Monitoring and Control: APSC has implemented the Corrosion Control Management Plan (CCMP). The CCMP is intended to provide a redundant, five-part program of corrosion protection. JPO/USDOT has reviewed and concurred with the CCMP and its implementing procedures. The CCMP is designed to evaluate cathodic protection (CP) monitoring data and corrosion growth activity and history. It is also intended to manage data and the implementation of corrective actions. Additionally, the State/Owner Company Cooperative Corrosion Program will install over 20 new impressed current CP

systems. These systems are anticipated to cover up to 280 miles of belowground pipe.

* Mainline Valve 6-inch Bypass Piping: APSC is in the process of excavating and installing vaults around all buried check valves. Upon completion of the vault installations, these valves will be accessible for both visual and instrumented inspections. APSC Systems Integrity Group has recommended the facility asset managers design an improved monitoring and corrective action process to better control corrosion of mainline valve bypass lines.

* Pump Station and Valdez Marine Terminal (VMT) Facility Piping: APSC continues to aggressively evaluate corrosion inhibitor effectiveness at pump stations and the VMT. In the 1999 TAPS Corrosion Control Summary Report, APSC Systems Integrity Group recommended the Facility Asset Managers design an improved monitoring and corrective action process to better control corrosion of facility piping systems.

5.1.8 TAPS Pipeline Bridge Inspection and Repair

JPO efforts on TAPS pipeline bridge inspection and repair are documented in the JPO Engineering Report No. 00-E-020, titled Tazlina and Gulkana Pipeline River Bridge Crossings, dated June 15, 2000. A brief summary of this effort is provided below.

Purpose and Scope:

The APSC pipeline bridge inspection program requires a five-year inspection for structural integrity on all pipeline bridges. The JPO 1999/2000 oversight of TAPS bridge inspections included an assessment of the adequacy of pipeline bridge maintenance in general, and the inspection of the Tazlina and Gulkana River pipeline bridges, in particular. The project specific to these two pipeline bridges was selected for inclusion in the JPO Construction CMP and additional information can be found there.

Grant/Lease Compliance:

Principle (3) 'Permittees Management of Pipeline System Maintenance'; and Stipulation 1.18 Surveillance and Maintenance:

This review effort determined that APSC could not demonstrate that the pipeline bridge inspection program adequately ensured that identified maintenance deficiencies were corrected.

Conclusions:

Review of the pipeline inspection program revealed that inspections were, for the most part, conducted at the specified intervals and identified deficiencies were documented. The evidence of action taken to correct the deficiencies, however, was insufficient, which represents a failure of the corrective action process (see section 5.1.1). APSC has committed to develop a new procedure to cover this programmatic gap to reside in the APSC Manual MP 166, System Integrity Monitoring Program Procedures.

5.1.9 VMT Tanker Vapor Control System (TVCS) Management Review

Background:

The Valdez Marine Terminal (VMT) TVCS was designed to collect crude oil vapors from loading tankers and transport them to pressurizing compressors, to be used for either balancing the crude storage tanks, or as a fuel source for the power plant. Since these vapors are potentially volatile, the system must also prevent combustion. The TVCS was designed to accomplish this by preventing the accumulation of oxygen, and preventing the introduction of an ignition source. In the event these preventive measures fail, and combustion does occur, the TVCS is further designed to sense the event and respond through isolation and suppression.

The installation and implementation of this complex system was plagued with problems and malfunctions and became the object of intense public scrutiny. In April of 1999, JPO, the United States Coast Guard (USCG), and the Regional Citizens Advisory Council (RCAC) became concerned about the integrity of the system and initiated discussions with APSC which resulted in a management review of the TVCS. The JPO, USCG, and RCAC all participated in this management review.

Conclusion:

The TVCS management review was comprised of a gap analysis for five main areas of concern:

- * Management Controls
- * Operating Controls
- * Training
- * Procedures
- * Hardware

JPO personnel monitored all elements of the management review and have tracked the associated progress and commitments.

The most in-depth element of this review was the Reliability Centered Maintenance (RCM) analyses of the TVCS hardware. RCM, as was explained in section 3.1.2, is a highly prescriptive process for identifying the maintenance needs of equipment to ensure operational safety and functional reliability. Due to the complexity of the TVCS system, RCM analyses were conducted on the following sub-systems: (1) the Servomex oxygen analyzers; (2) the Fenwal detection, isolation, and suppression system; (3) the vapor arm to berth isolation valve; and (4) the TVCS controls.

The RCM analyses resulted in 456 action items. A number of these action items were recommendations for compulsory redesign; so designated because of the safety or environmental consequences of functional failure. JPO gave notice to APSC, via Letter No. 99-033-LB, that completion of all compulsory redesign recommendations identified in the RCM analyses must be completed for Berths 4 and 5. JPO also requested via Letter No. 99-087-JH, the disposition of all non-compulsory recommendations resulting from the RCM analyses.

APSC has developed a database which details each action item, the category (compulsory or non-compulsory), due date, and responsible individual. Tracking the resolution of these action items is a part of the JPO continuing work plan. See section 5.4 JPO Orders for further discussion of the JPO notice regarding the TVCS.

5.2 TAPS MAINTENANCE BASELINE ASSESSMENT

The work associated with this element, over the period covered by this report, has primarily involved (1) researching industry maintenance management strategies; (2) planning and scoping the integration of JPO agency participation; (3) briefing APSC on the intent of this effort and expectations for APSC participation; and (4) procurement of consulting maintenance management experts. Implementation of this work element commenced in November 2000. Initial work has consisted of criticality analyses of TAPS systems, and training of APSC and JPO personnel to the RCM process.

JPO has emphasized to APSC, as well as the owner companies, the need for this effort to meet the TAPS maintenance and right-of-way requirements discussed in section 4.0 Requirements above. APSC has recognized the benefits of this effort and formally agreed to support its implementation through the signing of a Memorandum of Agreement (MOA), dated January 9, 2001. Attachment (1) provides a copy of this MOA.

APSC has conducted their own Asset Maintenance Management (AMM) assessments, one for the Pipeline Business Unit (PBU) and one for the Valdez Business Unit (VBU). APSC procured a team of maintenance management consultants, headed by BP Amoco, to conduct these assessments, and has shared the associated philosophy, methodology, scope, and results with the JPO. APSC has begun implementation of the results of these assessments and has maintained an open relationship with JPO throughout these efforts.

The philosophical approach to maintenance management adopted for these assessments, as described to JPO, is very similar to that of the "World Class" maintenance management approach discussed in section 3.0 Background. The JPO AMM assessment will include a detailed review of these APSC maintenance management assessments to establish a unified understanding of what is considered "state of the art" maintenance management, as required by Principle 3 of the Grant and Lease (see section 4.0 Requirements).

5.3 JPO 1997/1999 MAINTENANCE CMP ISSUES

The following provides the results of JPO follow-up efforts on issues identified in the 1997/1999 Maintenance CMP. Follow-up results for many of these issues were captured in preceding sections of this report, and in those cases, the reader is referred to the applicable section:

5.3.1 TAPS Electrical Systems

JPO efforts on 1998 issues regarding TAPS Electrical Systems is documented fully in the JPO Engineering Report JPO-00-E-006, titled TAPS National Electrical Code Compliance, dated February 3, 2000. The following provides a summary of this effort:

This work effort was scheduled because of APSC's poor past performance and allegations from concerned employees. An Assessment was conducted in 1998 which consisted of 11 surveillances and resulted in five findings and six notices of violation. Follow-up surveillances were conducted in 1999 to ascertain the degree of APSC's improvement.

Grant/Lease Compliance:

Compliance to the following Grant/Lease requirements were evaluated through this monitoring effort:

- * Section 9 Construction Plans and Quality Assurance
- * 9.C (3) - Quality control, planning and inspection
- * 9.C (4) - Materials and services based upon quality control
- * 1.18 Surveillance and Maintenance
- * 1.20 Health and Safety
- * 1.21 Conduct of Operations

This review found APSC to be in compliance with the National Electrical Code (NEC). This indicates an overall improvement in NEC compliance on TAPS. Employees were found to have the proper Certificates of Fitness. No findings related to NEC code compliance were identified and the State Electrical Inspector wrote fewer Notices of Violation.

Conclusions: The JPO performed surveillances and an assessment in 1998 due to poor past performance and concerned employee allegations of violations of codes and procedures. The allegations were found to be unfounded with one exception: Pump Station 7 personnel working on the fire systems were found not to have the appropriate permits issued by the State Fire Marshal. APSC was notified of five findings and six notices of violation. The response to the findings was deemed appropriate and the six code violations were corrected. APSC's performance in 1999 did not result in any findings or observations.

The 1999 surveillances were conducted to verify that the corrections taken in 1998 continue to be effective. Results of these surveillances indicate that APSC's electrical code compliance has indeed improved and personnel have obtained the appropriate fire permits.

5.3.2 TAPS Preventive Maintenance

JPO has completed its review of the 1997/1999 Maintenance CMP issue regarding APSC management of TAPS preventive maintenance (PM). A specific PM concern regarded newly completed projects being commissioned and turned over to APSC operations, without providing the necessary PM procedures for newly installed equipment. JPO conducted follow-up surveillances designed to measure APSC management of this project turnover element. Specifically, the preventive maintenance procedures for the TAPS Digital Strong Motion Accelerograph (DSMA) and the VMT Backpressure Control System were reviewed. It was found that the required PM tasks were being completed and tracked through the APSC maintenance management software, Passport.

A review of open Priority 4 PM tasks³ was also conducted as part of the JPO continued evaluation of the APSC overall equipment maintenance strategy. A total of 563 open work orders were identified; which is an improvement over the 831 open and overdue work orders found in the 1998 JPO assessment, JPO-98-A-013. While the number of open priority 4 work orders has declined since the 1998 assessment, JPO will continue to monitor open work orders until the backlog is further reduced.

Priority 3 PM tasks were also reviewed. It was found that 156 supplemental work orders were written to complete PM tasks which were not completed at the originally scheduled maintenance interval. The importance of these delayed PM tasks could not be determined from the Passport information provided to JPO by APSC. Many were designated as a priority 3, which would appear to indicate

concern by the writer. JPO requested, via Letter No. 00-054-JH, that APSC review all open supplemental work orders written to correct deficiencies found on Priority 3 PM tasks.

5.3.3 Slope Stability

See section 5.1.4 Mainline Above Ground Monitoring and Maintenance, above for details regarding this 1997/1999 Maintenance CMP follow-up effort.

5.3.4 Erosion Control

See section 5.1.2 River and Flood Plains Monitoring and Maintenance, above for details regarding this 1997/1999 Maintenance CMP follow-up effort.

5.3.5 Valve Maintenance

The APSC TAPS Valve Program has dealt with multiple issues, including (1) testing mainline valves for sealing performance; (2) excavating, investigating and vaulting below ground check valves; and (3) development of the TAPS Valve Maintenance Management Plan. The following provides a summary of the status of these issues:

Mainline Valve Testing

APSC and JPO/USDOT entered into a Memorandum of Agreement (MOA) in 1997, which addressed the testing of 177 mainline valves by the year 2000. As a result of this program, all operating mainline valves have been tested. Testing results have so far necessitated the repair or replacement of three valves: Remote Gate Valves (RGV)'s 60 and 80, and Check Valve 122. The results of year 2000 testing have yet to be submitted to JPO for review.

Prior to year 2000 testing, APSC reported that five valves had a degree of measured leak through, although the rates were below the values that APSC had proposed as indicating that repair or replacement was warranted. Test data on a number of other valves also showed leak through, however, APSC noted that a temperature drop of oil in the pipeline during the test can cause a pressure drop that mimics leak through. Because of this, APSC argued that if the leak rate is small enough (equivalent hole size of less than 0.05 inches) and there are no other indicators of leak through, the test results are more likely due to a temperature drop than an actual leak in the valve. Hence, APSC reports these valves as having sealed, even though the data reports show leak through.

APSC has developed in-service performance criteria for valve leak through as part of their quality program. Nevertheless, JPO has informed APSC that deferral of repair of a valve with leak through will require approval from the Federal Authorized Officer, the Alaska State Pipeline Coordinator, and the US DOT/OPS. Decisions to defer repair of the valves will be based on an analysis of the particular valve and the impact of the leak through on spill scenarios, maintenance requirements and DOT requirements. All requests to defer repair and supporting documentation are due to the JPO by January 2, 2001.

Below Ground Check Valve Investigations

APSC has committed to excavate, inspect and perform necessary repairs on buried mainline check valves. APSC Corrective Action Request 95-002 and Government Letter No. 97-12193 set the rate of investigation at five valves per year through 2002. Currently, 24 valves have been excavated, with 16 remaining. As requested by JPO, all valves will be vaulted to facilitate future inspection, maintenance and monitoring.

JPO Engineering Report No. JPO-00-E-016 was generated as part of the Construction CMP and additional information is presented there. There were problems identified with the planning and management of the work done in 1999. The investigations revealed numerous seeps and weeps at many valves as well as uncovering various mechanical issues, and additional undocumented modifications of the type noted on other valves. The mechanical issues and undocumented modifications are resolved prior to reburial, but weeps and seeps remain a concern.

TAPS Valve Maintenance Management Plan

APSC has substantially completed the TAPS Valve Maintenance Management Plan (TVMMP). The TVMMP has been submitted to the JPO and review is ongoing. The TVMMP is perhaps one of the most comprehensive, multi-disciplinary, multi-system plans APSC has developed. It will track performance, maintenance, configuration and history for mainline valves, pump station valves and VMT valves. The plan represents a significant effort to provide configuration management tools to assure valve performance. APSC is to provide JPO with an annual report summarizing the status of the valve program. This annual reporting requirement will help insure that the plan is followed.

USDOT/OPS Regulatory Compliance

USDOT is taking enforcement action relating to the issue of APSC not investigating the internal corrosive effects of the hazardous liquids on 6" bypass valve piping in accordance with 49 CFR §195.418.

5.3.6 Work Pad Maintenance

JPO concerns regarding work pad maintenance pertain to the APSC corrective action process, which led to the JPO request for APSC to perform the Special Review of the Corrective Action Process, SR#00-03. See section 5.1.1 TAPS Monitoring and Corrective Action Process, for a discussion of this 1997/1999 Maintenance CMP follow-up effort.

Also, the above section 5.1.2.3 Assessment Report JPO-00-A-001, Alyeska Pipeline Service Company Compliance With Fish Passage and Related Environmental, Surveillance, Maintenance and Quality Program Requirements, provides discussion of this follow-up review effort.

5.3.7 Material Sites

JPO efforts on TAPS Material Sites is documented fully in the JPO Assessment Report JPO-00-A-003, titled Assessment of OMS Sites (Operations Material Sites), dated May, 2000. The following provides a summary of this review effort:

Purpose and Scope:

The purpose of this assessment was to determine if APSC was in compliance with Federal Grant of Right of Way and State Lease Stipulation 2.6 Material Sites, the provisions of the Federal and State material sale contracts, and the Mining and Reclamation Plans for each site. BLM Manual, Section 3600, Instruction Memorandum No. 99-021 requires annual inspections of mineral material sites on federal land. JPO policy requires annual inspection of the sites on state land as well. There are 73 active material sites used by APSC along the TAPS Corridor, 40 sites on federal land and 33 sites on state land. This assessment is based on the results of the surveillances conducted by various JPO staff members between June 21 and September 25, 1999.

Grant/Lease Compliance:

Stipulation 2.6 Material Sites:

JPO Finding No. 00-A-003-F/01: Three sites were in non-compliance with Grant/Lease Stipulation 2.6.1.1. Material was taken from three sites without current material sale contracts. These actions constitute a non-compliance with Grant/Lease Stipulation 2.6.1.1. because APSC did not have written approval from the Authorized Officer or the Pipeline Coordinator to remove the material at the time it was taken.

APSC reported these situations to JPO before they were discovered by JPO's review of APSC's 1999 Year End Report for TAPS OMS Sites. JPO assessed triple charges in each case as called for in the federal and state material sale contracts. APSC has paid the charges assessed on these sites. This finding is now closed.

JPO Finding No. 98-A-016-F/1: This finding was generated as a result of a 1998 assessment and remains open. It discussed six sites (three gravel and three riprap) which were not in compliance with the mining and reclamation sites because each had side slopes steeper than the maximum measurement listed in the mining plan.

The 1999 field inspections revealed the slopes of the three gravel sites listed in this finding had been repaired. APSC had suggested posting warning signs at the three rip rap sites to warn the public of the danger of the steep slopes as well as revising the mining plans. Two of the rip rap sites had warning signs posted on the pit floors during the 1999 field inspections and the last site was posted with warning signs in December, 1999.

APSC submitted the proposed revisions to the mining and reclamation plans in APSC Letter 00-15549. JPO found the language unacceptable and by JPO Letter NO. 00-026-JH instructed APSC to provide more clarity and detail to the mining plans.

APSC revised the three mining plans a second time and submitted them to JPO with APSC letter 00-15839 dated May 31, 2000. JPO approved the changes in the mining plans by JPO Letter No. 00-108-LM dated June 23, 2000 and requested APSC to make a determination of the appropriate side slopes for the three sites and submit them for JPO approval. This is the only outstanding issue remaining for JPO Finding No. 98-A-016-F/01.

Conclusion

The OMS sites used by APSC are clean and well maintained. There was no evidence of erosion in any of the sites inspected this summer. There has been minimal

change in the quality of the mining sites between the 1997, 1998 and 1999 on-site inspections.

JPO will work with APSC to close out the sites that are no longer under contract to insure they have been reclaimed as stated in the reclamation portion of the mining plans.

5.3.8 Change Management (AAI 1955)

The results of this work element have been incorporated in the JPO 1999/2000 Construction CMP report. See the JPO 1999/2000 Construction CMP report for a detailed discussion of the status of this effort.

5.4 JPO ORDERS AND NOTICES 1999-2000

JPO's Comprehensive Monitoring Programs revealed numerous gaps in APSC's efficiency in completing work that JPO found was essential to maintaining pipeline integrity, protecting public safety and the environment. APSC had continually deferred work on several projects JPO felt needed immediate attention. Several key issues involved noncompliance with the Federal Grant and State Lease terms, such as slope stability at Squirrel Creek. JPO determined that work on several key items could no longer be continually postponed. This decision led to JPO's issuance of eight orders and three notices to APSC between August and December 1999.

These orders fall into two basic categories: (1) long standing issues where work schedules have continually slipped past specified completion dates; and (2) urgent situations that require immediate attention. Some long standing issues needing corrective action were reported in previous CMP reports, such as the cold restart of the pipeline, resolution of audit action items, and slope stability for above ground pipe. JPO used the order process to get APSC focused on resolving these items. The orders contain a wide range of issues and vary in significance. Some of the more urgent situations involved testing of the fire suppression system for the eighteen crude oil storage tanks at the Valdez Marine Terminal (VMT), and conclusion of the management review of the VMT Tanker Vapor Control System.

The following is a discussion of the orders and notices JPO issued in 1999. The table below specifies dates and status of the issues.

JPO ORDERS AND NOTICES

	ORDERS AND NOTICES BY STIPULATION 1.6 of the FEDERAL GRANT & STATE LEASE	RESULTS	STATUS
1	ORDER: Slope Stability Order issued 8/11/99. Corrective action plan for slope stability and aboveground pipeline maintenance on Squirrel Creek slopes (Stipulations 3.5.1, 3.9.1)	Complete	CLOSED 1/4/01
2	ORDER: Pungs Crossing Bridge Order issued 10/4/99. Replace the bridge at PLMP 289.5, Pungs Crossing, to provide safe access to the right-of-way and the pipeline for oil spill response. (Stipulation 2.14.3)	Complete Bridge replaced	CLOSED 10/24/00

3	ORDER: Grey Stream Fish Passage Order issued 10/29/99. Implement corrective action to allow for fish passage at Grey Stream (PLMP 790.9), so construction could be completed between May 15 and July 15, 2000. (Stipulations 2.5.1.1, 2.8.1, 3.9.1; Lease Section 22)	Complete	CLOSED 7/26/00
4	ORDER: Cold Restart Procedure for the Pipeline Order issued 11/5/99. JPO directed APSC to provide a final schedule for development and implementation of the cold restart procedure for TAPS, specifically completion of laboratory testing, development of the cold restart procedure, final hydraulic model updates and revision of the TAPS operating procedure manuals and design basis documents. (Stipulation 1.21.1)	In progress	OPEN
5	NOTICE: Audit Action Item Status Notice issued 10/25/99. JPO provided notice to APSC regarding closure of five audit action items remaining from the 1993 audit of TAPS: 1) AAI 1955 - Configuration management 2) AAI 2076 - Operation of RGV control system in Triconix mode 3) AAI 2113 - Completion of a qualification development program 4) AAI 50528 - Access road and workpad bridge design compliance 5) AAI 50552 - Install secondary containment in pump station tanks	In progress In progress Complete Complete Complete	OPEN OPEN CLOSED CLOSED CLOSED
6	ORDER: Non-Plenum Cables at OCC Order issued 10/15/99. JPO ordered APSC to replace all non-plenum rated cables located in the Operations Control Center at the Valdez Marine Terminal under floor plenum. (Stipulations 1.20.1, 1.21.1)	Complete Cables replaced	CLOSED 6/5/00
7	NOTICE: Tanker Vapor Control System Compulsory Redesign, Valdez Marine Terminal Notice issued 10/25/99. JPO directed APSC to complete all compulsory redesign conclusions and recommendations identified in the Reliability-Centered Maintenance reports for Berths 4 and 5 at the Valdez Marine Terminal, and to submit their plan and schedule for redesign completion for Berths 4 and 5 to JPO for review and approval. (Stipulations 1.20.1, 1.21.1, 2.2.1.1)	In progress (Compulsory)	OPEN
8	NOTICE: Tanker Vapor Control System Management Review Notice issued 11/23/99. JPO directed APSC to provide a detailed plan and schedule to conclude the management review of the non-compulsory items in the Valdez Marine Terminal tanker vapor control system, to include the requirements listed in JPO's report on the VMT TVCS Management Review of November 22, 1999. (Stipulations 1.20.1, 1.21.1, 2.2.1.1)	Completed (Non-compulsory)	CLOSED 1/26/01

9	ORDERS: Test the Valdez Marine Terminal Fire Suppression System 1) First Order: Issued 10/14/99. To ensure the functionality of the crude oil storage tank subsurface foam systems at the Valdez Marine Terminal, JPO ordered APSC to conduct a functional test of all subsurface foam systems by 12/31/99. (Grant Stipulations 1.17.1, 1.20.1, 1.21.1; Lease Stipulations 1.20.1, 1.21.1)	Complete	CLOSED March 200`1
10	2) Second Order: Issued 11/8/99. JPO asked for more specifics: (1) APSC is to submit a plan for ensuring crude oil storage tank subsurface foam systems are operable; (2) to specify which subsurface fire systems are operational; (3) which tanks have blockages in their fire foam distribution systems; and (4) what fire prevention and response measures are in place as a result of the blockages	Complete	
11	3) Third Order: Issued 12/2/99. JPO ordered APSC to clean and inspect crude oil storage tanks and develop contingency measures at the Valdez Marine Terminal. This order amended, restored, and expanded the first order of 12/31/99.	Complete	

5.4.1 Valdez Marine Terminal

5.4.1.1 VMT Crude Oil Storage Tanks - Fire Suppression System

JPO issued three orders to APSC concerning the testing of the eighteen crude oil storage tank subsurface fire foam systems at the Valdez Marine Terminal.

First Order: Conduct Functional Test of Fire Suppression System:

On October 14, 1999, JPO/USDOT ordered APSC to conduct a functional test of all subsurface foam systems by December 31, 1999, to ensure the functionality of the crude oil storage tank subsurface foam systems at the Valdez Marine Terminal. The subsurface fire foam suppression systems are situated below the oil surface in the eighteen storage tanks at the Terminal. APSC conducted a test of the subsurface foam system for Tank 14 September 1999, which proved the tests could be completed without adverse consequence. The test involved flowing seawater (without foam) into each tank as if the system were activated to fight a fire. The objective of the test was to assure JPO that the subsurface foam system will operate as designed.

Although no foam was injected into the system, the test was conducted as close as possible to normal operating conditions, and demonstrated that sea water could be pumped into Tank 14. JPO specified the remaining required tests had to be functionally equivalent to the test of Tank 14. JPO also specified that, in order to ensure the functionality of the fire suppression system at the Valdez Marine Terminal, APSC must complete preventive maintenance inspection and testing of fire suppression systems to the frequency requirements of the National Fire Protection Association (NFPA) 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. JPO ordered the requirements of NFPA 25, which are more stringent than State requirements. This will assure JPO the best possible maintenance standards are being met. JPO requested APSC to provide the NFPA 25 agreement by January 31, 2000. APSC

timely submitted the final NFPA 25 maintenance frequencies to JPO and satisfied this portion of the order.

Second Order: Operability of Fire Foam Systems and Response Measures:

Since the functionality of the fire suppression systems remained indeterminate into November 1999, JPO issued another order November 8, 1999, upon learning portions of the subsurface fire foam distribution system in Tank 9 were found to be blocked during tank cleaning. JPO specified that, since the tests in the first order of October 1999 may not conclusively prove that the fire foam systems were fully operational, the first order would be held in abeyance (temporarily suspended) until further notice. However, JPO specified the NFPA requirements would remain in force. In the second order, JPO directed APSC to specify 1) which tanks may have blockages in their fire foam distribution systems, 2) what interim fire prevention and response measures are in place as a result of the blockages, and 3) submit a plan for rapidly ensuring the crude oil storage tank subsurface foam systems are operable.

Third Order: (1) Tank Cleaning, Inspection, and Testing, (2) Interim Measures, (3) Disposition of Sediment and Sludge, and (4) Preventive Maintenance:

(1) Tank Cleaning, Inspection, and Testing: JPO issued a third order to APSC to restore and expand the first two orders and cancel the November 8, 1999 amendment. In addition to the items required in the first two orders, JPO directed APSC to immediately clean and inspect crude oil storage tanks and develop emergency fire contingency measures at the Valdez Marine Terminal. JPO directed APSC to demonstrate subsurface fire foam systems were operational and effective on four tanks by April 30, 2000. APSC was also directed to develop and submit to JPO (1) a methodology and schedule for initial testing and annual re-testing of fire foam systems on all tanks with subsurface fire foam systems; and (2) a methodology for accurately determining sludge levels and quantities in oil storage tanks.

Schedule For Testing and Annual Re-Testing of Fire Foam Systems on the Tanks. APSC developed a schedule for annual testing of the fire foam systems. A preventive maintenance task was created for all eighteen storage tanks, specifying that each tank will be flushed on an annual basis by flowing crude oil through the fire foam system. APSC submitted the first emergency fire contingency plan to JPO December 12, 1999, which JPO felt needed major modification. APSC submitted a second plan for emergency contingency fire suppression in July 2000, which JPO accepted. The plan is now in place, and requires a methodology to continually test the system on an annual basis.

Determining Sludge Levels in Crude Oil Storage Tanks. APSC developed a methodology for accurately determining sludge levels and quantities in crude oil storage tanks. Combining infrared images of the outside of the tanks with manual depth gauging along the exterior tank walls and at the center of the tank was successful in determining sludge levels. In March 2000 APSC began conducting measurement and profiling of tanks by performing infrared radiation and tape gauging of each crude oil tank to determine levels of accumulation. APSC determined nearly all eighteen crude oil storage tanks had varying amounts of sludge covering the fire-fighting subsurface foam dispersing pipes used for fire suppression. The sludge prevented the fire suppression system from effectively functioning. The tanks contained more sediment than was first anticipated. The first schedule APSC had provided JPO included steps to reduce the sludge levels and evaluate the foam dispersing piping system. APSC began tank flushing procedures, beginning with Tank 6 in February 2000 and found fluidization seemed

to work. Sediment processing from the tanks was completed and results were verified by entry into the tanks.

Spider and Crossover Piping. APSC worked on a fire system hydraulic model to ensure the foam suppression spider systems were not blocked, and did viscosity tests for waxy oil to ensure foam could pass through the mixture. APSC determined the most effective method to test whether the subsurface foam fire suppression system is functional, was to use a system of spider piping and crossover piping to keep the pipes flushed out and prevent plugging. The use of crossover piping proved to be successful in this endeavor. The subsurface foam spider piping inside of the crude tanks has ten six inch spider branches extending radially from the center hub. Foam solution flows into the center hub via a foam line and discharges through the spider branches. The new cross over piping connects a line to the main foam line, allowing crude oil to be diverted to the foam spider piping. The crossover piping makes it possible for the subsurface foam suppression system to work effectively by periodically flushing the foam spider piping to prevent blockage.

APSC completed the crossover piping modifications for all crude oil storage tanks by the end of 2000. APSC also initiated preventive maintenance to annually flush the tanks to assure functionality of the tank fire suppression system. In a December 28, 2000 letter to JPO, APSC stated the fire suppression systems in the Valdez Marine Terminal crude oil tanks were now determinate and fully functional. JPO conducted surveillances to verify system functionality and has closed the order.

(2) Interim Measures:

Access For Emergency and Fire-Fighting Vehicles to Tank Farms. JPO directed APSC to keep all roads open for emergency and fire-fighting vehicles to ensure year round access to the East and West tank farms. Some roads were not accessible in the winter. APSC removed snow from all tank farm access roads during the winter of 1999-2000 and retained an avalanche consultant. JPO expects APSC to have more than one access road to the tank farm be accessible at all times during the winter months for emergency access and evacuation.

Over-the-top suppression. JPO directed APSC to provide a final written plan, including a schedule for implementing interim prevention and response measures including procedural changes and over-the-top supplemental fire foam system able to reach all tanks. After considering the advice of RCAC consultants, the Fire Marshall and subject matter experts, JPO concurred with APSC that the over-the-top application may not be feasible for the unique layout of the tank farms at the Valdez Marine Terminal. JPO expects APSC to continue to explore practical alternatives to provide over the top protection for the tanks that cannot be reached with the equipment presently on site. JPO will continue to work with APSC on this matter.

Contingency Plan For Evacuation of the West Tank Farm. JPO ordered APSC to submit an emergency fire contingency plan, including an evacuation plan for the prevention, detection, and prompt abatement of a fire at the Valdez Marine Terminal. The evacuation plan was to include the West Tank Farm and all other Terminal locations not currently covered. In July 2000, JPO received and accepted a satisfactory contingency and evacuation plan (EC-71-VT).

(3) Disposition of Sediment and Sludge: JPO ordered APSC to provide written plans for the management and disposition of sediment in the storage tanks. APSC was directed to consider all environmentally acceptable options during the

planning process, including incineration, reprocessing, refining, shipment to appropriate disposal sites, and intermingling with crude oil loaded on tankers. Once sludge levels were determined, APSC had to decide what to do with the tank sediment. The most feasible solution was to reprocess the sediment by mixing it with diesel to turn it back into liquid form. This way, it could intermingle with crude oil for loading on tankers for refining. This mixture was then transferred from one tank to another for storage until shipment. In the future, APSC plans to provide JPO an annual "contour map" of each tank that will indicate sediment accumulation depth levels. This decision turned out to be a successful solution to the sediment disposal problem.

(4) Preventive Maintenance: The final National Fire Protection Association (NFPA) 25 maintenance frequencies submitted to JPO January 31, 2000, satisfies the requirements of this item. JPO had ordered APSC to complete inspection and testing of the fire suppression systems to the frequency requirements of the National Fire Protection Association (NFPA) 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. JPO ordered the requirements of NFPA 25, which are more stringent than State requirements that changed NFPA 25 preventive maintenance frequencies to an annual basis. JPO and APSC resolved this issue through coordination. JPO ordered APSC to prove the operational integrity of the subsurface foam fire suppression system of all tanks on an annual basis.

APSC has committed to do annual preventive maintenance tasks to ensure the tank fire suppression system remains functional. The company also developed three procedures to flush the subsurface foam system and form a system capable of monitoring and clearing the foam distribution spider piping in the crude oil storage tanks. APSC demonstrated that crude oil flush was able to clear any build-up that formed in the piping and clear a large area in the tank bottom at the outlet of each spider pipe.

APSC has completed, documented, and inspected all work required by JPO's three 1999 orders for tank fire suppression at the Valdez Marine Terminal. JPO verified the work satisfied all order requirements and closed the orders in February 2001.

5.4.1.2 VMT Tanker Vapor Control System

JPO issued two notices to APSC concerning the VMT Tanker Vapor Control System. The first notice was issued October 25, 1999. It stated in order to ensure continued safe and environmentally sound operation of the tanker vapor control system, APSC must complete all the compulsory redesign conclusions and recommendations identified in APSC's Reliability Centered Maintenance (RCM) process for Berths 4 and 5 at the Valdez Marine Terminal.

In June 2000, JPO requested an update on APSC's progress of updating the maintenance strategy for the tanker vapor control system, specifically records management, training and development, regulatory compliance tools, project management, document and drawing control, change management, procurement and maintenance.

JPO issued a second notice regarding the tanker vapor control system November 23, 1999, stating JPO had received APSC's Valdez Marine Terminal Tanker Vapor Control System Management Review of October 7, 1999. JPO determined the review was deficient and did not contain several items JPO had previously specified were required. JPO directed APSC to provide detailed plans and schedules to conclude the review, along with a description and schedule of the planned action

to be taken with regard to each of the TVCS RCM non-compulsory maintenance recommendations. On February 4, 2000, APSC responded with plans for completing the implementation of the findings and recommendations of the TVCS management review. This included a schedule for RCM non-compulsory recommendations contained within the TVCS data base. This information satisfied the JPO requirement for a description and schedule for completion of the RCM non-compulsory recommendations. JPO closed the November 23, 1999 notice January 26, 2001.

JPO currently estimates 82% of the work is complete for the order on the compulsory items. APSC estimates another six to eight months to complete the rest of the project. During the last quarter of 2000, APSC halted work on this project to commit resources to the Berth 4 renovation at the Valdez Marine Terminal. Berth 4 was temporarily removed from operation for repair and maintenance work. APSC sent JPO a Tanker Vapor Control System Management Review Implementation Plan which is currently under JPO review. The report provided the progress to date on APSC's completion of the action items associated with the tanker vapor control system. Since early 2000, APSC has provided JPO with quarterly progress reports of the completed work.

5.4.1.3 VMT Operations Control Center (OCC) Non-Plenum Cables

JPO issued an order on October 15, 1999 directing APSC to replace all non-plenum (ventilation air duct) rated cables in the Operations Control Center at the Valdez Marine Terminal by February 28, 2000. This was to ensure APSC compliance with National Fire Protection Association standards and the National Electric Code. APSC had planned and funded the work since 1994, but postponed it. Once the project began, APSC expanded the scope of work to include identifying additional cables needing replacement, identifying and marking all cables for future reference, and updating all drawings. JPO approved APSC's request for an extension to complete work by May 1, 2000, since a significant amount of work had been completed. JPO surveillance has verified that all work required by the order was finished, and the order was closed.

Regulatory Compliance

The USDOT conducted a safety review of the Operations Control Center (OCC) at the Valdez Terminal to determine the adequacy of the Supervisory Control and Data Acquisition (SCADA) system. As a result, DOT plans to issue a "Letter of Concern" relating to peak load data processing, emergency call handling, supervisor intervention and data point auditing.

5.4.2 Pipeline System

5.4.2.1 Slope Stability

On August 11, 1999, JPO ordered APSC to provide a corrective action plan for repair and maintenance to bring the above ground pipeline support system on Squirrel Creek's north and south slopes into compliance with Federal Grant and State Lease Stipulations 3.5.1 and 3.9.1. Soil movement and melting permafrost had affected the position of some vertical support members on the slopes. JPO directed APSC to provide a corrective action plan which would be either a request for a design basis waiver with a thorough justification or a plan for repairs for compliance with Grant and Lease Stipulation 3.5, and design basis requirements regarding the dynamic displacement calculation for the south slope

of Squirrel Creek. JPO also directed APSC to provide a summary of the specific repairs to be included in the corrective action plan.

APSC completed project F-171, replacing numerous vertical support members (VSM) on the north side of Squirrel Creek. Due to permafrost thaw over the years, these new VSM's were placed at a lower depth of fifty feet for stabilization. VSM repair on the north side now allows the pipe to function fully as designed, and APSC has committed to properly maintaining the VSM's in the future. JPO reviewed and approved APSC's design basis variance request for Squirrel Creek, which closes APSC's noncompliance with Grant and Lease Stipulations 3.5.1 and 3.9.1 and JPO's August 11, 1999 order. JPO approved the design basis variance request for Squirrel Creek provided APSC implements monitoring, surveillance, and maintenance to prevent mass movement of slopes and to protect the aboveground pipe against mass movement. JPO approved the request in recognition of APSC's corrective action plan, completed risk assessment, project F-171 VSM repairs at Squirrel Creek, repair of field instrumentation, re-evaluation of potential for soil liquefaction, and APSC's long term commitment to continued surveillance, monitoring, and maintenance of the aboveground system and slope stability.

5.4.2.2 Pungs Crossing Bridge

On October 4, 1999, JPO directed APSC to replace the bridge at PLMP 289.5 to provide access to the right-of-way and pipeline by October 31, 1999. Pungs Crossing bridge was declared unusable in 1998, and became a block point on the right-of-way for oil spill response. JPO's concern was that the continued existence of this block point could impact a timely response to an oil spill in the area. The approved Pipeline Oil Discharge Prevention and Contingency Plan requires that APSC be able to efficiently reconnoiter the pipeline and have reasonable access for response actions. The continued existence of this block point would have impacted a timely response to a spill in the area. Rather than allow the bridge to remain a block point into the year 2000, JPO directed APSC to fix the bridge by October 31, 1999.

APSC temporarily reinforced the bridge until weather and ground conditions allowed for the bridge to be completely replaced in 2000. The Pungs Crossing bridge was replaced earlier in 2000 and is now safe for pipeline surveillance vehicles. A September 2000 JPO surveillance verified that all requirements of the order had been satisfied and closed the order.

5.4.2.3 Grey Stream

APSC was ordered to implement corrective action to allow for fish passage at Grey Stream (PLMP 790.9), so construction could be completed between May 15 and July 15, 2000. JPO directed APSC to (1) Develop a draft conceptual design for JPO review and meet with JPO representatives in pre-application meeting; (2) finalize the design and submit permit applications, including a notice to proceed application and an issued for construction package to appropriate agencies; (3) complete all construction, including necessary re-vegetation between May 15 and July 15, 2000; and (4) continue to monitor the stability and effectiveness of a new channel and other remedial efforts in accordance with a project monitoring plan to be submitted for JPO review and approval along with permit applications.

APSC submitted an application for the Corps of Engineer permit, along with a coastal project questionnaire on February 23, 2000. APSC likewise submitted a land use permit application and an Alaska Title 16 statutes fish habitat permit

for rerouting and restoration to JPO Alaska Department of Natural Resources February 17, 2000. APSC completed the corrective actions, and JPO considered the order satisfied and closed the order. APSC completed the corrective actions and JPO considered the order satisfied and closed the order.

5.4.2.4 Cold Restart

On November 5, 1999, JPO ordered APSC to provide a final schedule for the development and implementation of the cold restart procedure for the pipeline. The schedule was to include dates for completion of laboratory testing, development of the cold restart procedure, final hydraulic model updates, and revision of TAPS operation procedure manuals and design basis documents.

In December 1999, APSC submitted a schedule to JPO for the development and implementation of the cold restart procedure for TAPS to be completed early in 2000. JPO approved the schedule. In June of 2000, APSC informed JPO the schedule would be delayed until November 30, 2000 because of complications in development and implementation. JPO approved the extension due to the difficulties APSC has had developing a method for cold restart, specifically with the gelling of crude oil at cold temperatures. APSC committed to provide JPO (1) a draft interim cold restart procedure by October 31, 2000; and (2) an updated project schedule for the permanent cold restart procedure by November 30, 2000. The final interim procedure is planned to be in place by winter 2001.

5.4.2.5 Audit Action Items

In 1993, the TAPS Owner companies promised the U.S. Congress that they would correct audit action items (AAI) and prevent their recurrence. Congress tasked the U.S. Department of the Interior to verify the AAI's were successfully closed. The Department has performed this task using a process where JPO reviews and approves APSC's corrective action plans for the most critical AAI's and verifies implementation.

JPO issued a notice to APSC to resolve some of the long standing issues that were originally identified as audit action items (AAI) from the TAPS audits of the 1990's. Several audit items had slipped beyond scheduled closure deadlines. JPO specified resolution of five remaining audit items:

1) AAI 1955 - Change Management. AAI 1955 was scheduled for closure by the end of 1999, but APSC was unable to complete the requirements within that time. JPO and APSC are discussing an agreement on the closure requirements and a target closure date. JPO continues to work with APSC to resolve the change management issues. The issue of change management is discussed in-depth in JPO's CMP Construction report. This AAI remains open.

2) AAI 2076 - Operation of Remote Gate Valve Control System in Triconix Mode. This project cannot be completed until a communication link with sufficient bandwidth is established between the pump stations and the remote gate valves along the pipeline. Availability of the bandwidth is dependent on Alascom to complete digitization of the current microwave system, or the availability of a fiber optics system that meets the necessary communication reliability criteria. Alascom is scheduled to complete digitization of the microwave system by the end of 2001. JPO will continue to track this AAI, which remains open.

3) AAI 2113 - Completion of a Qualification Development Program. APSC completed the corrective action for this AAI, which JPO closed April 4, 2000.

4) AAI 50528 - Access Road and Workpad Bridge Design Compliance. JPO reviewed and approved the closure package APSC submitted. JPO checked fourteen bridges to verify they met APSC operational requirements and closed this AAI December 21, 2000.

5) AAI 50552 - Install Secondary Containment in Pump Station Tanks. APSC completed the corrective action for this AAI, which JPO closed March 17, 2000.

6.0 Conclusions

This report has attempted to provide a summary of JPO oversight efforts related to monitoring and maintenance of the TAPS over the 1999/2000 timeframe. Numerous oversight issues have been presented; some have been resolved, others remain as continuing oversight efforts. JPO oversight of the TAPS is an ongoing and highly dynamic effort. As such, tracking, trending, and reporting on the multitude of oversight issues is a necessary function of the JPO. To accomplish this function, JPO has initiated a systems based monitoring approach and implemented a CMP database system which provides for capturing the various JPO oversight efforts in a comprehensive and quantitative manner. The oversight issues presented in this report and the associated on-going efforts to address resolution of deficiencies are tracked through the use of this database system. As such, the conclusions presented below will continue to be evaluated through ongoing JPO oversight efforts, with the current status of each continually updated in the CMP database.

The following provides the overall conclusions drawn from the JPO 1999/2000 Maintenance CMP efforts:

6.1 TAPS MONITORING AND MAINTENANCE

Per the requirements listed in section 4.0 Requirements above, the JPO is tasked with determining the adequacy of the maintenance practices implemented on the TAPS. This requires JPO to establish programmatic criteria by which APSC will be measured to determine whether or not the TAPS is being adequately maintained (this criterion is still under development and is related to the efforts described in the above section 3.1 JPO Position on TAPS Maintenance and Useful Life). The approach JPO is taking regarding maintenance of TAPS is based upon 3 main elements: (1) The monitoring of TAPS system performance to defined functional parameters; (2) Corrective action implementation when system performance degrades to outside the functional parameters; and (3) Defined maintenance management systems which link monitoring results with effective corrective action.

JPO has initiated oversight in accord with the 3 elements listed above and has accumulated data which evidences some inadequacies in maintenance management and opportunities for APSC to improve its maintenance practices on TAPS. TAPS maintenance and the management thereof is particularly critical today as TAPS is a declining asset and the APSC workforce is aging. The following provides a summary conclusion regarding APSC management of TAPS maintenance:

APSC Corrective Action Process: The corrective action process at APSC, whereby the results of systems monitoring efforts transition into maintenance work activities (or documented justification for no work required) is inconsistent, ill defined, and in some cases absent. A clearly defined and integrated corrective action process, which considers all the maintenance needs of TAPS in

a comprehensive manner, in order to make work funding and scheduling decisions, is not apparent within the APSC maintenance management process⁴. This was concluded from not only JPO oversight efforts, but APSC audits as well (reference section 5.1.1 TAPS Monitoring and Corrective Action Process).

The continued monitoring of this APSC management deficiency is integral to JPO's work plan. Specifically, the details associated with this issue are to be incorporated into the TAPS Maintenance Baseline Assessments as described in section 2.2 above.

6.2 GRANT/LEASE AND REGULATORY COMPLIANCE

As described in section 2.0 Methodology/Scope, JPO has implemented a systems based oversight structure which provides for evaluation of compliance to Grant/Lease and regulatory requirements as they pertain to the systems which comprise TAPS. This report has described the Grant/Lease and regulatory non-compliances and potential non-compliances identified through this CMP effort in section 5.0 Results. These are entered into the JPO CMP database to facilitate tracking their resolution and development of a history of APSC's compliance with the requirements of the Grant/Lease.

In addition to this system based oversight, the USDOT conducted enhanced inspections on TAPS during Year 2000 using subject matter experts within the Office of Pipeline Safety (OPS). OPS conducted comprehensive compliance inspections in the areas of corrosion, mainline valves, oil spill response, SCADA, geotechnical, and overpressure protection.

The non-compliances and potential non-compliances identified through the JPO 1999/2000 Maintenance CMP efforts are listed below. It should be noted, however, that many of these have been corrected; yet they are still listed here in order to provide completeness in describing JPO maintenance oversight results for 1999/2000. For each Grant/Lease non-compliance cited, the non-compliant TAPS system is identified, along with the applicable section of this report which provides the results discussion.

Principle 3 'Permittees Management of Pipeline System Maintenance':

System: Linewide (programmatic)

JPO finds APSC's lack of a clearly defined corrective action process, which links TAPS systems monitoring results to TAPS systems maintenance activities, to be inconsistent with this principle. This is viewed as a deficiency in the management of the TAPS monitoring and maintenance programs (see sections 5.1.1, 5.1.2.3, 5.1.4, 5.1.5, 5.1.8, and 5.4 above).

Stipulation 1.17 Fire Prevention and Suppression:

Systems: VMT Fire Suppression System (section 5.4)

Stipulation 1.18 Surveillance and Maintenance:

Systems: Aboveground Mainline Pipe (section 5.1.4)
Belowground Mainline Pipe (section 5.1.5)
Pipeline River and Stream Crossings (section 5.1.2.3)
Pipeline Bridges (section 5.1.8)
VMT Fire Suppression System (section 5.4)

Stipulation 1.20 Health and Safety:

Systems: VMT OCC (section 5.4)
VMT TVCS (section 5.4)
VMT Fire Suppression System (section 5.4)

Stipulation 1.21 Conduct of Operations:

Systems: Linewide - Cold Restart (Section 5.4)
VMT OCC (section 5.4)
VMT TVCS (section 5.4)
VMT Fire Suppression System (section 5.4)

Stipulation 2.2 Pollution Control:

Systems: VMT TVCS (section 5.4)

Stipulation 2.5 Fish and Wildlife Protection:

Systems: Pipeline River and Stream Crossings (sections 5.1.2.3 and 5.4)

Stipulation 2.6 Material Sites:

Systems: Material Sites (section 5.3.7)

Stipulation 2.8 Disturbance of Natural Water:

Systems: Pipeline River and Stream Crossings (section 5.4)

Stipulation 2.14 Contingency Plans:

Systems: Pipeline Bridges (section 5.4)

Stipulation 3.2 Pipeline System Standards:

Systems: Belowground Mainline Pipe (section 5.1.5)

Additionally, USDOT/OPS identified the following regulatory non-compliances:

Systems: Pressure Control Systems
49 CFR, Part 195.428 - Pressure Valve Procedures
Mainline Valve Maintenance
49 CFR, Part 195.420 - Mainline Valve maintenance
External Corrosion Control
49 CFR, Part 195.416 - Cathodic Protection adequacy
Internal Corrosion
49 CFR, Part 195.418 - Internal corrosion investigation
General Safety requirements
49 CFR, Part 195.401 - level of Safety
49 CFR, Part 195.402 (c) (3) - normal operating
procedures
49 CFR, Part 195.402 (d) (1) - abnormal operating
procedures
Pipeline Repairs
49 CFR, Part 195.422 - pressure increase during
excavation

- Stipulation 3.3 Construction Mode Requirements:**
Systems: Belowground Mainline Pipe (section 5.1.5)
- Stipulation 3.5 Slope Stability:**
Systems: Aboveground Mainline Pipe (sections 5.1.4 and 5.4)
- Stipulation 3.9 Construction and Operation:**
Systems: Aboveground Mainline Pipe (sections 5.1.4 and 5.4)
Pipeline River and Stream Crossings (section 5.4)

1 Weller, G., and Patricia A. Anderson, "Implications of Global Change in Alaska and the Bering Sea Region - Proceedings of a Workshop University of Alaska Fairbanks June 1997", The Center for Global Change and Arctic System Research University of Alaska Fairbanks, April 1998.

2 Vertical Support Members comprise the support structures for the above ground pipe as well as house the heat pipe systems used to maintain permafrost conditions. VSMs are spaced at 60 foot intervals along the above ground pipeline. TAPS is comprised of approximately 78,000 VSMs and 61,000 heat pipes.
3 Priority 4 PM tasks were defined in the APSC Maintenance System Manual, MP-167, rev 2, as medium priority work with a required completion date of fourteen to ninety days from the date they are created. Priority 3 PM tasks were defined as high priority work, or prescriptive regulatory maintenance work, with a required completion date of fourteen to ninety days from the date they are created.

4 This comprehensive decision process is considered by JPO to be the equivalent to a "change management board" as described by the "Configuration Management" process. This is significant as AAI 1955 closure is dependent upon APSC implementation of a management philosophy which incorporates elements of the configuration management philosophy (reference JPO report 00-E-001, titled AAI 1955). See JPO 1999/2000 Construction CMP for a discussion of AAI 1955 and the status of closure.

Agreement between JPO and APSC on Critical System Integrity Review signed 1/19/01 is available upon request.

Attachment A Scope for TAPS Integrity Review is available upon request